UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,703	02/27/2004	Peng Liu	10559-892001	9319

20985 7590 10/13/2006

FISH & RICHARDSON, PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
ROSASCO, STEPHEN D	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 10/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/789,703	LIU ET AL.	
	Examiner	Art Unit	
	Stephen Rosasco	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *1-10 and 21-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/27/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

Applicant's election without traverse of Group II (claims 11-20) in the reply filed on 9/25/06 is acknowledged.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 11-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Kroyan (6,794,096).

Kroyan teaches (see claims) a method of correcting an image intensity imbalance for a phase shifting mask (PSM), the method comprising: computing a near-field image for a pair of phase shifters; and determining a bias for each phase shifter in the pair of phase shifters based on the near-field image, wherein the bias corrects the image intensity imbalance.

And wherein receiving the near-field image includes simulating the near-field image using a layout of the PSM.

Kroyan also teaches (cols. 5-9) that simulation requires rigorous calculations of electromagnetic field (EMF) scattering in the mask (e.g. calculations based on Maxwell although near-field image 403 is computed, this computation merely serves to simulate

aerial image 405, which is the plane of interest (i.e. where the feature generated by the PSM will print on the wafer).

And that after obtaining the image intensity imbalances using the aerial image, a bias table can be created in step 305, which can be stored in a library. The bias table can indicate the appropriate bias for particular pairs of shifters, mask properties, stepper properties, and illumination conditions. The OPC tool can access this bias table during rule-based OPC (step 306).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kotani et al. (2003/0074646) in view of Kroyan (6,794,096).

The claimed invention is directed to a method comprising: deconstructing at least a portion of a mask pattern into a plurality of primitives; retrieving corrections corresponding to the primitives from a library, said corrections having been generated using a rigorous method and including edge corrections and at least one of corner corrections, space corrections, shape corrections, and edge-to-edge corrections; and applying the retrieved corrections to the primitives to synthesize a near-field corresponding to said at least a portion of the mask pattern.

The applicant discusses the limitations of the prior art in that although the "fast method" is simply and quickly calculated, it ignores some of the physics of EM field

transmission, such as diffusion around edges and interferences that may be caused by nearby features.

In the claimed invention to model the features that would result from applying the mask, the designer models the pattern of the electromagnetic (EM) field transmitted through the mask, and based on a comparison of the modeled features to the desired features, the designer may change his mask and repeat this process.

Kotani et al. teach a mask pattern generation apparatus of generating mask patterns from designed patterns, comprising: preparing a correction library in which a plurality of an edge coordinate group and a correction value group to correct the edge coordinate group are registered; acquiring a first edge coordinate group from a first designed pattern; checking whether or not an edge coordinate group agreeing with the first edge coordinate group is registered in said correction library; calculating the correction value group to correct the first edge coordinate group by simulation based on a first correction parameter, when the edge coordinate group is not registered; registered a pair of the calculated correction value group and the first edge coordinate group into said correction library; reading the corresponding correction value group from said correction library, when the edge coordinate group is registered; correcting the first designed pattern in accordance with the calculated correction value group or the read correction value group, to generate the first mask pattern; acquiring a second edge coordinate group of a second designed pattern different from the first designed pattern; checking whether or not the edge coordinate group agreeing with the second edge coordinate group is registered in said correction library; calculating the correction value group with respect to the second edge coordinate group by the simulation based on a second correction parameter, when the edge

coordinate group is not registered; registering a pair of the calculated correction value group and second edge coordinate group into said correction library; reading the corresponding correction value group from the correction library, when the edge coordinate group is registered; and correcting the second designed pattern in accordance with the calculated correction value group or the read correction value group, to generate a second mask pattern.

And wherein the preparing of said correction library includes: generating beforehand said correction library in which the first edge coordinate group and correction value group included in the first designed pattern are registered, before the designed of the designed patterns has ended.

The teachings of Kotani et al. differ from those of the applicant in that the applicant teaches the use of the rigorous method for generating the corrections.

Kroyan is included here as discussed above.

It would have been obvious to one having ordinary skill in the art to take the teachings of Kotani et al. and combine them with the teachings of Kroyan in order to make the claimed invention because it would be obvious to one in the art to employ the more rigorous corrections of Kroyan in the library of Kotani et al. to produce a better product.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Rosasco
Primary Examiner
Art Unit 1756

S.Rosasco
10/4/06